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*Un*bitten, yet *un*deterred: the Salem witch trials as a demand-pull phenomenon

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Abstract

Purpose – In a relatively new and interesting study, a new theory was offered to explain events surrounding the Salem witch trials of 1692. According to the author of that study (Carlson), the behavior of the accusers can be explained by an outbreak of encephalitis. The purpose of this paper is to offer evidence that contradicts that hypothesis.

Design/methodology/approach – To these ends, this paper examines life expectancy data from the Wigglesworth 1789 life expectancy tables to reject the Carlson thesis. The current study also provides a graphical exposition of the Salem witch trials as a demand-pull phenomenon.

Findings – According to the data, the age at-death minus the Wigglesworth life expectancy of 28.15 years for the witch trials accusers averages between 26.4 years, a figure that is statistically significant. This result contradicts Carlson's view that the accusers encountered encephalitis. Finally, the stylized graphical model presented here provides an additional way of viewing the witchcraft episode in 1692 Salem as a demand-pull phenomenon.

Originality/value In refuting previous hypotheses about witchcraft episodes, and by offering a graphical model of witchcraft hysteria as a demand-pull phenomenon, this study re-focuses attention on the ethico-economic aspects of the Salem witchcraft episode.

Keywords Organizations, Demand management, Rents, United States of America, History

Paper type Research paper

1. Introduction

In an interesting twist of timing, Carlson (1999) and Mixon (2000) offer new theories seeking to explain events surrounding the Salem witch trials of 1692. Carlson's hypothesis, that the behavior of the accusers can be explained by an outbreak of encephalitis, fits the historical trend of juxtaposing the events in Salem with epidemiology. Carlson's case, built largely on the physical symptoms/behavior of the young accusers, along with the topography of Salem Village, Massachusetts, is arguably a more plausible epidemiological explanation of this particular witchcraft episode than is the ergotism (i.e. bread poisoning) hypothesis that is explained in Mappen (1980).

On the other hand, Mixon (2000, p. 179) suggests that the witchcraft episode in Salem offered the ministers there (e.g. Samuel Parris) an opportunity to successfully employ Puritan religious doctrine regarding witchcraft to increase the demand for ministerial services and church membership. Thus, while Carlson's (1999) hypothesis is consistent with the physical symptoms of the accusers, Mixon's (2000) model works better to explain the behavior of Reverend Parris, the other ministers and the religious institution they represented at the time[1].

However, other hypotheses have recently emerged, particularly the macrofoundations model of Oster (2004) suggesting that witchcraft trials (episodes) may be large-scale

examples of violence and scapegoating that are prompted by deterioration in economic conditions brought on primarily by an increase in winter severity and food shortages. As Oster's data indicate, the most active period in witchcraft trials coincided with what climatologists refer to as "the little ice age" – a period of lower-than-average temperatures that dates from 1550 to 1800[2]. Within this broad period, the coldest sub-periods were the 1590s and 1680-1730 (Oster, 2004, p. 218)[3].

Mixon (2004, p. 241) states that Oster's research on winter weather severity and witchcraft episodes "weakens [the] new hypothesis in Carlson (1999) that the physical condition of the accusers (melancholia/delirium, hallucinations, mania, etc.) in Salem ... can be explained by an epidemic of encephalitis, a mosquito-borne illness exhibiting many of the same symptoms possessed by the accusers." As Mixon (2005) indicates, symptoms of the modern Eastern Equine Encephalitis – a variant of the strain believed by Carlson (1999) to have infected the Salem accusers – appear between four and ten days of being bitten, suggesting that mosquito activity would have been prevalent in January –February 1692 Salem. This prevalence would have been unlikely, given that mosquito activity would have succumbed to hibernation during one of the coldest sub-periods of "the little ice age".

With Carlson's (1999) epidemiological case somewhat weakened, through the work of Oster (2004) and Mixon (2005), this study offers evidence that rejects the case for an encephalitis-caused witchcraft episode in 1692 Salem. In doing so, we re-focus attention on the ethico-economic aspects of the Salem witchcraft episode. To that end, the current study closes with a graphical exposition of the Salem witch trials as a demand-pull phenomenon.

2. *Un*bitten: empirical evidence

Any case for a mosquito-borne encephalitis explanation of the accusers' behavior during the Salem witchcraft episode of 1692 would have to account for the prognosis of someone infected by the disease. According to *Web*MD (2008), encephalitis is an inflammation of the brain caused by a viral infection that can be passed to humans through bites from mosquitoes. However, "most people who are bitten by infected mosquitoes ... do not get any symptoms. And only a very small number of people who have symptoms get encephalitis (*Web*MD, 2008, p. 1)". *Web*MD (2008, p. 1) goes on to point out that, in general, symptoms that come on suddenly and are very bad from the start, such as those exhibited by the young accusers in 1692 Salem, point to encephalitis that can be deadly.

Because the only treatment for encephalitis that exists today is supportive care provided by hospital staff, one would hypothesize that the incidence of death from encephalitis among the young accusers, assuming they had contracted the virus, would have been high. They exhibited symptoms that arose suddenly and seemed, by all accounts (Starkey, 1949; Boyer and Nissenbaum, 1974; Ray, 2008) to be deleterious from the beginning. To examine this incidence, demographic data on the eight primary Salem witch trials accusers were collected.

As one might expect, dates of birth and death for seventeenth century Colonial Americans is not readily available today. The Ray (2008) are able to pinpoint the birth and death dates for four of the eight primary accusers[4]. All of the data collected on the accusers are shown below in Table I. Among the accusers, Mary Warren and Sarah Churchill were the oldest, at about 20 years of age in 1692. At just nine years old, Reverend Parris' daughter, Elizabeth (Betty), was the youngest at the time the trials began. Parris also survived quite some time, dying in 1760.

To assess the data that are available (and shown in Table I), life expectancies are required. The first life expectancy data for an American population was generated by Wigglesworth (1793) about 100 years after the Salem witch trials were concluded[5]. However, those data were drawn from the populations of Massachusetts, Maine and New Hampshire, representing a good portion of New England. This area is particularly relevant to a study of the life expectancies of Salem witch trials participants. According to Wigglesworth, life expectancy at birth within the New England population of the late 1700s was 28.15 years.

According to the data shown in Table II, all four of the accusers for whom data are available exceeded the Wigglesworth 1789 life expectancy (at-birth) of 28.15 years, even though they each are purported by Carlson (1999) to have encountered what appears to be a deadly form of arboviral encephalitis. The age at-death minus the Wigglesworth life expectancy of 28.15 years for these four accusers ranges from a low of 7.85 to a high of 48.85 and averages between 26 and 27 years. This average (26.4) is significantly greater than zero at better than the 0.05 level, a noteworthy point given (1) that the Wigglesworth data come from the late 1700s New England, and not the late 1600s New England as they should and (2) Carlson's (1999) encephalitis theory[6]. Finally, if the age- at-death minus the Wigglesworth life expectancy-at-birth for each of

Name	Born	Died	Age at death
Sarah Churchill	1672	after 1731	> 59
Elizabeth Hubbard	1675		
Mercy Lewis	1675		
Elizabeth Parris	1683	1760	77
Ann Putnam	1680	1715	36
Mary Walcott	1674	> 1719	> 45
Mary Warren	1672		
Abigail Williams	1680 (1681)		

Note: Data for accusers with complete biographical entries above come from Ray (2008), with the exception of "died" for Walcott, which comes from *Wikipedia*

Table I.
Demographic data on the Salem witch trials accusers

Name	Wigglesworth (1793)
Sarah Churchill	31.85
Elizabeth Parris	48.85
Ann Putnam	7.85
Mary Walcott	16.85
Mean	26.35
SD	(17.97)
Significance test:	
H_0: Mean ≤ 0	
H_A: Mean > 0	
t-statistic	2.931*

Note: *Denotes significance at the 0.05 level

Table II.
Age-at-death minus life expectancy-(at-birth) of the Salem witch trials accusers

the four accusers not included in our average above (of 26.4) had been zero, the average for all eight accusers is 13.18 years, a number that is also significantly greater than zero at the 0.05 level[7]. Each of these results appears to reject the encephalitis theory in Carlson (1999).

3. Demand-pull aspects of the Salem witchcraft hysteria

By further weakening, if not rejecting, the theory in Carlson (1999), the section 2 results above allow us to re-focus attention on the ethico-economic, public choice and industrial organization aspects of the Salem witchcraft episode. Mixon (2000) only briefly explores the potential industrial organization aspects of the Salem witch trials by alluding to a stylized (static) model of the delivery and use of Puritan religious doctrine in seventeenth century Colonial America. That brief exploration draws upon research by Ekelund *et al.* (1989) regarding the Medieval Catholic Church's use of Biblical doctrines on usury as a form of rent seeking. The Ekelund *et al.* (1989) graphical model is amenable to an examination of the role of Puritan religious views on witchcraft in Colonial America[8].

As an extension of Mixon (2000), Figure 1 presents such a graphical model, wherein the Puritan Ministers of 1692 Salem (e.g. Samuel Parris, etc.) who controlled the events from both a spiritual and judicial perspective provided Puritan ministerial (and judicial) services as a local monopoly franchise (i.e. as holders of a local monopoly franchise, albeit a temporary one). As Mixon (2000, p. 181) suggests, the Puritan church/theology maintained monopoly-like rights in 1692 Salem to (1) interpretation of the spectral evidence, (2) biblical interpretations of witchcraft and the fate of witches, and (3) acceptable quasi-academic scholarship concerning the witchcraft phenomenon[9].

Returning to Figure 1, D_1 represents the demand for eternal salvation, and price represents the full-cost sacrifice imposed on church members for services rendered. The quantity axis in Figure 1, which is labeled "Recipients of Eternal Salvation", represents Puritan church attendance or membership (Ekelund *et al.*, 1989,
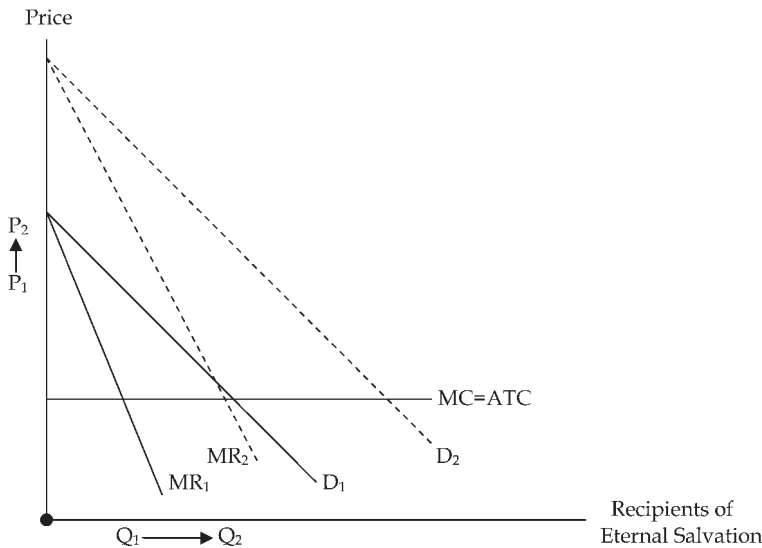

Figure 1.
The Salem witch trials as a demand-pull phenomenon

pp. 310-11)[10]. Finally, Ekelund *et al.* (1989, p. 310) our stylized (static) model in Figure 1 is simplified by the assumption of constant costs as in.

In re-telling some of the history of the Salem witchcraft episode, Mixon (2000, pp. 179-180) writes:

> The Reverend Samuel Parris, his daughter Betty (age 9), and her cousin Abigail Williams (age 11) came to Salem Village in 1689 after the Parish offered the Calvinist minister a position there. Salem Village was one of the most contentious in the Massachusetts Bay Colony, and previous ministers . . . had been hounded out of the pulpit by acrimony and the refusal of the congregation to pay "rates" to support ministers they did not want (Starkey, 1963, p. 5). The hiring of Parris was acrimonious. In a process that took most of 1689, Parris demanded "unheard of things" such as "clear and permanent title" to the parsonage and its grounds and a salary of £66, with £22 paid in provision (Starkey, 1963, pp. 5-8). However, the congregation allowed use of the parsonage during occupancy only, and denied Parris common courtesies such as complimentary firewood provision during winter. His refusal later to ordain deacons and his promotion of public penances for trivial matters suggested that Parris felt animosity over this earlier treatment (Starkey, 1963).

In our monopoly model of the Salem witchcraft hysteria, Parris sought to solve his difficulties in dealing with various factions of Salem Village, some of which are highlighted in the passages above, by using witchcraft hysteria to increase the demand – as shown by the shift from D_1 to D_2 in Figure 1 – for ministerial services. First, Parris' young daughter, Elizabeth (Betty), and her young cousin, Abigail Williams, who lived with the Parrises, were at the center of the hysteria. During the winter of 1691-92, Elizabeth (Betty), Abigail, and other young Salem Village girls (Table I) spent many nights learning voodoo, magic, fortune-telling, sorcery and the art of making "witch cakes" from Tituba, Parris' house slave (Starkey, 1963, pp. 8-17; Mixon, 2000, p. 180)[11]. Elizabeth (Betty) and Abigail were also the first of the young accusers to exhibit signs of an affliction, and they shortly thereafter began accusing other Villagers of the practice of witchcraft.

Second, and consistent with Weisman (1984), ministers such as Parris and Lawson were in a unique position to use a witchcraft hysteria to increase the demand for ministerial services, given that witchcraft in 1692 Massachusetts could not be understood outside of the context of Puritan theology. Witchcraft was a derivative from crucial assumptions within Puritan beliefs (Mixon, 2000, p. 181). Similarly, Hansen (1969) states that, in a situation where the truth was difficult to find, as with witchcraft in Colonial America, the people of Salem turned to the experts – the clergy[12]. Finally, as Mixon (2000, p. 180) states:

> At the outbreak of the crisis, Parris pronounced that God was angry and sending forth destroyers in the form of witches (Gragg, 1992). No fewer than six other ministers soon [after the witchcraft hysteria began] came to Salem, and all, including Parris, reproached and rebuffed anyone with alternative ideas about ferreting out witches; idle superstition was not permitted, and "spectral evidence" was admitted in court by the ministers who served as counsel and jurists in the proceedings which would follow (Starkey, 1963, pp. 28-9) . . .

Again, these ideas lay the foundation for our use of the monopoly model (shown in Figure 1) of the Puritan ministers' role in the Salem witchcraft hysteria.

Returning once again to Figure 1, the increase in demand (from D_1 to D_2) led to an increase in both the price of ministerial services rendered, from P_1 to P_2, and church attendance (membership), from Q_1 to Q_2. That the Salem ministers used the hysteria to accomplish these increases is consistent not only with the passages above, but also

with earlier work in this genre by Boyer and Nissenbaum (1974), which suggests that Parris and the other ministers exploited the young girls (accusers) for personal and corporate gain. This earlier work is also recognized here, and in Mixon (2000, p. 182):

> Parris, a former businessman who had often preached of the importance of economics and commerce, had been experiencing difficulty in filling the village meetinghouse for weekly worship and even in persuading the congregation to pay his salary. However, most villagers turned to him for explanation and guidance during the witchcraft episode, and church attendance and Parris's stature in the village soon soared. According to Boyer and Nissenbaum, Parris drew on the energies of the population to shore up his own leadership ...

Thus, from our perspective, the Salem ministers accomplished the goal stated for them in Mixon (2000), and even earlier in Boyer and Nissenbaum (1974), of increasing the demand for Puritan ministerial services rendered. The stylized graphical model presented here, which goes beyond Mixon (2000) and Boyer and Nissenbaum (1974), provides an additional way of viewing the witchcraft episode in 1692 Salem – an episode we describe as a demand-pull phenomenon that augmented individual and corporate wealth.

4. Concluding comments

As pointed out in Mixon (2000, p. 182), between 10 June and 22 September of 1692, 19 men and women, along with two dogs, were hanged to death as witches, and one man was pressed to death for refusing to plead to the indictment of witchcraft. Our study has not focused on why these particular 20 individuals (and others) were targeted. That was done in Boyer and Nissenbaum (1974) and Mixon and Treviño (2003). Instead, we have contributed to studies that have analyzed the 1692 Salem witchcraft hysteria in two areas. First, and in conjunction with Oster's (2004) climate hypothesis of the origins of witchcraft episodes in Europe, and Mixon's (2005) comments on that climate hypothesis, data presented here refutes the latest, and arguably the most profound, epidemiological explanation of the behavior of the accusers (i.e. the young girls) – that of arbiviral encephalitis. Further refutation (i.e. refutation beyond Mixon, 2005) of epidemiological theories serves to focus more attention on the public choice and ethico-economic aspects of the events in Salem in 1692.

Second, and to that end, we extend the work of Boyer and Nissenbaum (1974) and Mixon (2000) by presenting a graphical model of the events concerning witchcraft in Salem. Our graphical model is based upon similar graphical models in earlier research on the Medieval Catholic Church, wherein "it is axiomatic that among believers the demand for salvation ... [is] price inelastic", and that in "return for a variety of payments, not all monetary, the church dispensed such goods as ritual, solace, appeasement, status and ultimately, salvation (Ekelund *et al.*, 1989, p. 311)". The graphical model presented here, in combination with previous public choice explanations of witchcraft episodes, offers an additional example of the relevance of economic theory in understanding disparate social phenomena throughout history.

Notes

1. Mixon's (2000) public choice explanation follows from the research of Boyer and Nissenbaum (1974).
2. According to Oster's results (2004, pp. 220-1), a one standard deviation decrease in temperature leads to a 0.2 SD increase in witch trials. Oster's results (2004, pp. 223-4) also indicate that a one SD decrease in economic growth leads to a 0.3-0.5 SD increase in witch trials.

3. As Oster (2004, p. 218) indicates, these periods were cold enough to leave Iceland completely surrounded by ice and for the Thames River to freeze routinely.

4. Given the time period involved, one could argue that a 50 per cent data recovery rate is quite remarkable.

5. For details on Wigglesworth's methodology, including its limitations, (Vinovskis, 1971).

6. With this consideration, using the Wigglesworth 1789 life table to calculate age-at-death minus life expectancy-at-birth for these four young girls (in 1692) seems reasonable.

7. Using the Wigglesworth data, each of the four additional accusers could have died five years before their life expectancy (at birth) and the average age-at-death minus life expectancy-at-birth of 10.68 is statistically significant at the 0.10 level. In fact, about 36 years could be shaved off of the 105 years (approximately) of life- minus-life expectancy – the figure that produces the mean in Table II – by the four additional accusers and the mean for all eight accusers would remain significantly greater than zero at the 0.15 level, a reasonable significance cut-off given the sample size under consideration (Leamer, 1978, 1988; Kennedy, 2003).

8. In other words, the background events and evidence taken from the Salem witch trials is consistent with the public choice perspective of the activities of the medieval Catholic Church found in Ekelund *et al.* (1989), and also in Ekelund and Hébert (1991).

9. Starkey (1963, p. 37) defines "spectral evidence" as acceptance by the court of an accuser's dreams, hallucinations and fancy as factual evidence of the actions and behavior of the accused. Examples cited in Mixon (2000) for item (1) come through questions, such as "Why weren't the accused churchgoers?" and "Can witches cry/ produce tears?" The Biblical tenet, that "Thou shall not permit a witch to live", played an important role in deciding the fate of those who were convicted of witchcraft in 1692 Salem. Finally, Reverend Deodat Lawson's "Pray, Pray, Pray" sermon, which eventually became a well known, important publication, along with narratives by Reverend Increase Mather, indicates just how dominant the clergy of 1692 Salem were in terms of producing influential, quasi-academic accounts of the witchcraft phenomenon in New England (Mixon, 2000, p. 179).

10. Ekelund, *et al.* (1989, p. 311) indicate that the medieval Catholicism offered hope to those souls (demanders) who were forced to confront the short and often brutish conditions of daily existence. Given the historical climate data reported in Oster (2004), Ekelund *et al.*'s wording (e.g. "... brutish conditions of daily existence") seems appropriate in this context as well.

11. According to Starkey (1963, pp. 8-17), Tituba was known by other Villagers to "traffic with" the Devil.

12. These interpretations serve as additional indication of why we view Parris and the other ministers involved in the Salem witch trials as (temporary) holders of (local) monopoly rights to interpret Puritan theology and to pass along acceptable reactions to witchcraft. Mixon (2000, p. 181) and Karlsen (1987, pp. 138-40) point out also that it was the number of people who spoke out about witchcraft in the language of the clergy, as well as the effectiveness of the clergy in shaping popular conceptions of witchcraft, that distinguished the 1692 Salem witch trials from other witchcraft episodes. And, according to Starkey (1963, pp. 19-24), when the young girls' affliction was relegated from the physical world to the spiritual world, the responsibility for its treatment was thrust upon the (Puritan) ministry.

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